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A Dissertation, On
Digestion,
By,
James F. Griffin
of
South Carolina.

January 1827

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All animals have the power of assimilating bodies or substances heterogeneous to themselves to their own nature, by subjecting them to the action of a peculiar set of organs, and preparing them for their nutrition; to this process Physiologists have given the name of Digestion.

In commencing a dissertation upon the subject I have selected, it will be necessary in the first place to describe the organs by which the process is effected, and then to treat of the phenomena attending it. It has already been stated that digestion is a function common to all animals, and there is perhaps not a more striking example of universal similarity, existing in all classes of animals, than in the possession of an internal canal, into which the food is received and prepared for nutrition; it is our intention to speak of this function as it occurs in the human system.

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Digestion cannot with propriety be considered as a simple process, but rather the result of a successive series of actions performed by parts remote and dissimilar from each other; these may be divided and viewed under two heads, first as preparatory, and second as peculiar or essential. The alimentary substances subjected to the first or preparatory organs undergoes certain mechanical changes into minute divisions, and at the same time admixture with various fluids to prepare them to be acted on by the second or essential organs, by which they are changed in their natures, and lose in part their peculiar properties prior to being resolved into new elements.

The first part of digestion commonly called the mechanical, consists in mastication and deglutition; the second part in chymosis and chylosis.

Mastication or that process by which the food received into the mouth in a solid state, is bruised and triturated

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by the teeth, appears to be one of the most important parts of digestion; for, by it the food previously in an entire and indigestible mass, is reduced to a consistency, more congenial with the delicate texture of the lining membrane of the pharynx and oesophagus, and made more susceptible to the influence of the gastric liquor of the stomach; Mastication thus performed, the morsel is carried by the action of the tongue to the palatine arch, and if this latter be agreeably affected, it passes into the pharynx, by the muscular contractions of which it is thrown into the oesophagus, and by this canal it is conveyed into the stomach.

The second series of processes concerned in digestion, are the three we have called essential, and consist in Chymosis and chylosis; these are performed in the digestive tube, the former in the stomach, the latter in the intestines; the digestive canal is divided into three parts, the stomach, the

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small intestines, and the large intestines, it commences at the cardiac orifice of the stomach and terminates at the anus; although these intestines are distinguished by different, and at the same time peculiar uses, yet the structure of the entire canal is so far common as to consist of an equal number of coats or membranes, viz. the peritoneal, the muscular, the cellular, and the mucous.

The division we have given is by no means arbitrary, but founded on nature, and serves as a guide to conduct us in our treatment of derangements in these parts.

We presume it will not be expected of us to enter into a minute anatomical description of the different organs concerned in the process of digestion, either as it regards their formation, or exact position; as it would tend to lengthen our dissertation very considerably,

without affording any additional information to that which may be collected from almost any system of analogy.

We have already spoken of the manner in which the food is conveyed into the stomach, it will be proper next to speak of the changes it undergoes after being subjected to the influence of the gastric juice, or in other words to that secretion contained within the cavity of the stomach, chymosis first claims our attention, we understand from this, the conversion of the alimentary mass received into the stomach into chyme, which has been defined by a celebrated writer to be." *a homogenous pasta, greyish, of a sweetish taste, slightly acid and retaining some of the properties of the food."

The precise manner by which the food taken into the stomach is converted into chyme has never yet been explained, from the earliest dawn of medical

* Paris on digest. Page 55

science down to the present period, this subject has continued to baffle the ingenuity of the wisest Physiologists.

A variety of theories have been invented and a number of experiments instituted, for the purpose of correctly ascertaining the properties of the gastric juice, and the power it possesses in dissolving food coming under its influence; the diversity of results have been almost coequal with the multiplicity of experiments, but a large majority go to prove that it possesses solvent powers in a very eminent degree; although some persons have denied the property of solution in the gastric juice, still we are convinced that it is the principal agent in the process of digestion.

It will now be proper to be expected, as it gives an account of the different theories of digestion held at various times, from Hippocrates down to the present day, to make a communication that they are hypothetical in an extent to excuse us from dwelling upon them, or

even mentioning them.

Most [illegible] upon this subject [illegible] [illegible] [illegible]

conclusive experiments of this great physiologist. Without any tedious notice of many of the experiments of Spallanzani, it will be enough to represent merely I allude to those made with hollow balls and tubes. Réaumur & Spallanzani enclosed pieces of the toughest meats, and of the hardest bones, in small perforated tin cases, to guard against the effects of muscular action, and then introduced them into the stomach of a buzzard; the meats were uniformly found diminished to three-fourths of their bulk in the space of twenty four hours, and reduced to slender threads, and the bones were wholly digested, either upon the first trial, or a few repetitions of it. These are the words of Dr Paris in his treatise on the properties of the gastric juice. Spallanzani experimented upon himself in a similar way. He introduced into his stomach hollow balls and tubes, containing food, and pierced with holes. after allowing them to remain there for twenty four hours he drew them

out and found the contents to be well digested. In either of these cases it was impossible for the muscular contractions of the stomach, to have expressed any influence over the contents of the Falls. and we think it is equally certain, that the solution of the aliment, was exclusively owing to the agency of the gastric fluid of the stomach. Some of the ferments, including the inverates sugar = ded chymosis as action, or the same process by which aliment is changed in a vessel put on fire, the inexpediency of this doctrine, should have been a sufficient warning to the Physiologist of the present day, not to go into the same error by substituting galvanic fluid for vital heat.
No matter what sort of vessels may secrete the gastric fluid, whether it comes from the blood vessels of the stomach, or from a peculiar set of vessels whose office it is to furnish it, the existence of it is too evident, to require proof

to add to the validity of the assertion, and that it possesses solvent properties in a very eminent degree, the experiments already alluded to, go fully to establish, and place the fact beyond the reach of cavil.

Spallanzani describes the gastric juice to be a transparent fluid, yellowish, bitter, saline, little volatile or inflammable, and also to be the principal agent in chymosis; he was of opinion that it might be procured pure, and for this purpose he introduced sponge into the stomach, and by a thread withdrew it after a certain length of time, the impossibility of procuring it pure is now acknowledged, since it would inevitably be mixed with saliva, and other exhaled or secreted fluids, and occasionally even with pancreatic juice and bile, it is also admitted that it must differ in each animal according to the nature of the food upon which it has been nourished.

It seems to be an established opinion, that the gastric juice is poured unremittingly into the stomach and that its accumulation is one of the principal causes of hunger, also that it flows most abundantly when this viscus is gorged with food; the phenomena of hunger, we think, may also with propriety be referred to an energetic state of the gastric nerves, occasioned by an interval of inactivity, during which time their vital powers may be supposed to accumulate. Chymosis is truly a solution of alimentary matter, which becomes semifluid, loses a part of its original properties, and acquires new ones, we do not however consider it a chemical solution, but a vital one, of the special nature of which we are entirely ignorant, as we are also of many other actions of the body, and of the operations of nature.

The abundant collection of aliment in the

stomach, gives it greater amplitude, not of the nature from the mere mechanical distention, but of the vital. Its sensibility being called into play by the presence of appropriate stimuli. In proportion as the chyme is formed in the stomach it gradually passes through the pylorus into the duodenum, there to undergo another important change in the process of digestion. Stimulants do not of course convert chyme in the same period of time, that food which is pleasant and grateful to us, will be more speedily and easily digested. Rare and nauseous articles unwisely prepared, and indigestible in its nature. It is difficult to determine with any precision the time allowed for the conversion of food into chyme, and the passage of the latter from the stomach, but we may safely say that it is generally accomplished in the space of four or five hours.

to [illegible] the food in its regular progress through the alimentary canal was short, and it next proceeds to [illegible] it subjected, to be exposed, in [illegible] as it [illegible] passes the pylorus and flows into the duodenum. This organ is distended and its [illegible] increased [illegible] the contents, the propulsion of the food is retarded prior to its entrance into the duodenum, though its motion is considerable retarded by the flexuosity of this organ, which is not so long and shaping as the other small intestines, by its curves and by the numerous valvulæ conniventes lining its inner surface, the purpose of this retardation is to submit the chyme to the action of the bile and pancreatic juice, which are continually emptying into the duodenum, but which in this case are poured out in greater quantity, owing to the stimulation of these respective glands, propagated along their excretory ducts from the mucous surface

by the presence of the chyme. Not only is the Liver at this time in an unusual state of excitement, but the Gall Bladder is made to give out its contained bile in a greater quantity; it is after this mixture with two new fluids, and possibly with other exhaled juices of the intestines, that the chyme intimately penetrated with them, becomes more animalized and converted into chyle. As to the precise nature of the changes produced in the chyme, by the bile and pancreatic juice, or the respective uses of these two secretions, we do not know, we cannot assert anything positive, this like several other parts connected with the process of digestion, are involved in the abstruse regions of hypothesis, from which we trust the enterprise of genius may shortly rescue it.

On arriving at the ileocecal valve and having passed into the large intestines, the contents are

in length of ten or as it is, the intestine [illegible] a canal of one inch and, the remainder is now fecal or excrementitious.

Having now heard the successive processes to which the food is subjected, by Mastication, by Deglutition, by Chymosis, and Chylosis, whereby the most valuable and nutritive portion of it is conveyed into the thoracic duct, carried by this vessel into the left subclavian vein, and genally by this commingled with the general mass of the circulatory system, we trust we shall be excused from pursuing in its course the remaining portion, which has an infinitely more ignoble destination, and although in strict accordance with Physiological rules, it should be treated as a part of the subject of Digestion, yet, it may be omitted in the present instance, without any serious infraction

upon those laws.

A cursory notice of some of the usual concomitant phenomena attendant on digestion, will next engage our consideration.

Digestion is influenced considerably by the state of the mind at the time the food was taken. As one of the occupations or conditions of that organ, pleasure or disgust or anxiety are excited, the stomach and man act with lively energy on the ingesta taken in, on the contrary, the gratification which attends a favorite meal is, in itself, a specific stimulus to the organs of digestion, exhilarate the animal spirits, or in debilitated invalids the tender solicitude cast on inconsiderable exertion over the process of digestion. Thus the effect as it an agreeable meal, or tend to exhilarate our feelings, accelerate digestion

and on the quality of unaspirated gas, and therefore conversation, and on the other hand disappointed desires or ambition, give rise and melancholic tendencies, when its impress.

The desire for rich, and indulgent food are subsequent phenomena often even quite moral; this is most probably owing to cerebral congestion, which induces indirect debility, and consequently lassitude and languor.

The hour of exercise in which we indulge certainly modifies the process of digestion very materially, our studious habits or intense application of our hands, diminishes this process, by concentrating in the brain, that energy necessary for the stomach, mechanical employment has an opposite tendency, for the moderate motion which it gives to the hands, accelerates

the process, and prevents the too long sojourn of the food in the stomach.

It is spoken of by the celebrated Broussais that, the lively enjoyment we experience when respiration in an agreeable repast has been discovered a confused feeling of comfort in every part of the trunk, he further remarks, that the breathing, which during the first hours of digestion was pectoral, becomes manifestly more abdominal, while the chymous mass is passing through the pylorus into the small intestines.

Nervous agency appears to be essential to the process of digestion, if we divide the eighth pair of nerves, we destroy the secretory action of the stomach, and thereby prevent or suspend the process, or we might more properly observe, that plexus of the eighth pair which goes to supply the stomach.

It has been previously stated that most persons after eating a full meal, feel disposed to indulge in rest, and from experiment it has been proven, that a state of absolute quiet, very greatly assists the progress of digestion; to be satisfactorily convinced of the correctness of this position, Dr Haighton made the following experiment; he having procured two hounds, fed them equally and plentifully, in a short time after this, he set one of them to running and employed him in hunting for several hours, while the other was confined in a kennel at home, he then killed them both, and upon examination discovered that very little of the meal was digested in that dog which he had exercised so freely, but nearly the whole of it had been converted into chyme, in the one which had enjoyed the advantage of rest.

On the functions of the stomach, all the other functions of the body, in some manner depend, as through its agency they derive that support, which is essential to their existence. The human system is continually subjected to every variety of disease, climate, vicissitude of weather, and the mind is at one moment buoyed up by the gilded prospects of prosperity and plenty, and at the next it is repining at adverse fortune or groaning under the dejection and gloom of disappointed hope; these are the varied causes of a continual waste in the system, of course it is indispensable that we should supply this consumption of substance, this is done by the important function of Nutrition, or the art of assimilating foreign matter to that system, which it is intended to preserve, and by which the functions of Life, are kept in constant

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In closing this dissertation we would remark, that we have not aimed at a display, in either originality of sentiment, or novelty of inventions; digestion has so long been the theme of contemplation with the wisest and most learned Physiologists, for us to attempt anything more, than to cull from the observations and experience of our predecessors.

James F. Griffin
January. 1827.